

## METHOD FOR PRESERVATION OF VEGETABLE MATTER

**Field of the invention**

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The present invention relates to a method for preserving edible vegetable matter, particularly vegetables and herbs, which method consists of a heat treatment.

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**Background of the invention**

In the course of time several methods have been found which are suited for preserving vegetable matter. These methods 15 comprise drying, heating, freezing, salting and storing the vegetable matter in a preserving liquid. Each method, however, has its pros and cons. When the preserved product is intended to be included in a meal kit which is meant for chilled display in a shop an attractive fresh appearance of 20 the contents is important besides a good aroma. Then heating and storage in a preserving marinade type aqueous liquid are the best options. Such liquid, as described in the references below, often contains relatively high levels 25 of salt, sugar and/or acid. While imparting a salty, sweet or sour aroma during subsequent storage is quite acceptable for some types of vegetables or fruits, this is not true for vegetables which are consumed after grilling or roasting. Particularly for the preservation of herbs which are meant for inclusion in said chilled meal kits, neither 30 the use of those aqueous liquids, nor common drying or freeze drying processes forms an appearance sparing preservation method.

US 5925395 describes methods for preserving fresh vegetables wherein fresh vegetables are cut and exposed to a preserving aqueous solution comprising 0.1 - 10 wt.% of calcium ions and 0.1 - 30 wt.% of ascorbate ions or 5 erythorbate ions. Storage without losing fresh aroma, appearance and crispiness is claimed for up to 10 days. This method relates to vegetables that apart from being cut have not been further processed, anyway have not been roasted or otherwise heated.

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The fresh vegetables described in WO96/14760 are stored in a film, which contains a marinating agent, comprising vinegar, sugar, salt, flavourings and others. This method does not comprise vegetables that have been heat-treated.

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Vegetables roasted in an oven are widely used for preparing certain food products, such as packed ready-to-eat sandwiches. For this application the heat-treated vegetables need a shelf-life during which time their 20 appearance and aroma should closely resemble the appearance and aroma of vegetables immediately after the heat treatment. In WO 03/063600 a method is described where vegetables, after having been roasted, are submerged in a preserving aqueous marinade. This method allows prolonging the storage period during which the good aroma and 25 appearance of particularly roasted vegetables is retained and also microbiological safety is ensured. However, the method requires a specific marinade which can not be easily separated from the vegetables and which aroma 30 may be not compatible with the desired final food composition.

**Summary of the invention**

The present invention relates to a method as defined in  
5 claim 1 which is suited for preserving the typical aroma  
and appearance of vegetable matter during storage after a  
heat treatment. Aroma is herein defined as taste and  
flavour.

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**Detailed Description**

The present invention pertains to a method of preservation  
according to claim 1 comprising immersing vegetable matter  
15 in heated oil and subsequent storage under oil in a closed  
package. The method is useful because it does not  
substantially affects aroma and appearance of the treated  
matter.

20 The present stabilised heat-treated vegetable matter is  
particularly suited as an ingredient of meal kits which are  
meant for quickly providing a meal.

In the context of the present specification vegetable  
25 matter is understood to comprise edible plant material,  
particularly including vegetables, herbs, mushrooms and  
fruits in so far as these can bear the heat treatment  
mentioned in claim 1. Suitable vegetable matter for use in  
the invention comprises peppers, courgettes, aubergines,  
30 carrots, mushrooms and/or members of the botanical family  
of Allium such as onions and garlic, but preferably

consists of one or more items selected from the group comprising herbs, peppers, vegetables, garlic and onions.

Herbs are selected preferably from the group comprising  
5 rosemary, parsley, basil, marjoram, oregano, mint, thyme, bay, dill, mace, sage, sorrel, fennel and cress.

After an optional washing step the crude vegetable matter may be cut into pieces, slices or rings, preferably having  
10 a thickness of 0.4 - 1.5 cm, more preferably 0.5 - 1.0 cm. These are optionally covered with a film of an edible oil such as olive oil, sunflower oil or nut oil.

The method of the present invention is characterized in  
15 that the selected vegetable matter is relatively shortly immersed in an edible oil having a temperature of 140°C - 220°C, preferably 160°C - 220°C, for 5 seconds - 4 minutes. Then the heated vegetable matter is removed from the oil, optionally cooled down and immediately put in a package  
20 together with such amount of edible oil that the vegetable matter during storage either is fully immersed in oil or at least remains covered with a layer of oil.

For heating preferably a vegetable oil is selected, such as  
25 one of the common oils used for deep frying, e.g. soybean oil, sunflower oil, arachide oil and, preferably, olive oil or mixtures of those oils. The same type of oil can be used for covering the vegetable matter during subsequent storage.

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The optimum temperature and time for heating varies with the nature of the vegetable matter and also with the

thickness of slices. Preferably, both duration and temperature of heating are chosen such that the appearance of the vegetable matter is the least adversely affected. The skilled man is able to select with some trial 5 experiments suitable temperatures and times for obtaining the desired effect.

Some vegetable matter is so delicate that it can not bear the heating under the claimed conditions. For such matter 10 the invented preservation method is not suited.

After the heating step the vegetable matter is put without delay together with adhering and/or added oil in a package, which then, preferably, is tightly sealed. Optionally 15 further ingredients are added to the oil, e.g. suitable spices or other flavouring.

The atmosphere in the container may be substituted by a preserving atmosphere, using, for example, nitrogen, argon or helium.

20 Preferably a package material is used which is at least  
` partially transparent, which allows the consumer to inspect  
` the package contents. The invention also comprises a  
flexible and at least partially transparent package  
containing preserved vegetable matter which is obtained  
25 according to the method of the invention. A pouch made of  
polyethylene is a suitable package. Storage of the closed  
package under chilled conditions is recommended.

The vegetable matter contained in the package is selected  
30 and apportioned preferably such that it can be used as part  
of a meal kit. When preparing the meal the content of the  
package may be shortly heated, preferably when it is meant

for use as a so-called soffritto in an Italian meal kit. In that case preferably the further ingredients necessary in combination as a soffritto are included in the package.

5 The benefit of the invention is that vegetable matter when covered with or submersed in oil after being exposed to a heat treatment according to the invention retains its attractive appearance and/or aroma. Without wishing to be bound by theory, the effect of the method is believed to be  
10 based on the quick partial or full removal of moisture from the vegetable matter. Moreover, the heat exposure destroys any microbial activity and inactivates any deteriorating enzyme. Therefore it is not necessary, but neither it is excluded, to add a preservation agent to the contents of  
15 the package. When it is tightly closed, also the addition of an anti-oxidant is redundant. The good aroma and appearance of the contents can be preserved for several weeks. Preferably the vegetable matter is kept at chilled conditions, e.g. at 2-10°C in a refrigerator.

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Examples and comparative experiments

For examples 1-6, a vegetable matter mixture was prepared  
25 having the following composition:

9 g red onion slices  
5 g garlic slices

30 The vegetable matter mixture was fried in olive oil having a temperature indicated hereafter in table 1 (Oil temp.), and thereafter immersed in olive oil having room

temperature. The appearance of the vegetable matter was checked after directly after preparation and after 24 hours.

- 5 The resulting mixtures of oil and vegetable matter were stored at 7°C for 48 days and then tested for microbiological stability. In the stability test, the following organisms were tested: entoro-bacteria, yeast, lactobacilli, spores, listeria, staphylococcus, bacillus  
10 and E. coli. Results are shown in table 1.

For examples 7-12, a vegetable matter mixture was prepared having the following composition the following composition:

- 15 3 g fresh thyme  
3 g fresh rosemary

For comparative experiments A and B, the mixture as in examples 1-6 was immersed in olive oil heated to 85°C and  
20 115°C respectively in a jar. The vegetable matter was not removed from the jar, but the filled jar was taken of the heat and allowed to cool down to room temperature. The appearance was tested after taking of the heat and after 24 hours. Microbiological stability was tested as in examples  
25 1-12 after storage at 7°C for 48 days.

Table 1: Results for preparations of vegetable matter.

Ex.	Oil temp. (°C)	Time (s)	Appearance		Micro-biological stability
			Time = 0	After 24 hours	
1	140	30	Original separation of red in onion	Original separation of red in onion	OK
2	140	60	..	..	OK
3	150	25	..	..	OK
4	160	21	..	..	OK
5	170	20	..	..	OK
7	200	15	..	..	OK
8	140	30	Fresh green	Fresh green	OK
9	150	25	..	..	OK
10	160	21	..	..	OK
11	170	16	..	..	OK
12	200	10	..	..	OK
A	85	-	Water haze	Water haze and red colour migration in onion	Spoilage
B	115	-	Water haze	Water haze and red colour migration in onion	OK